National Institute of Environmental Health Sciences

Shifting suitability for malaria vectors across Africa with warming climates

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Abstract:

Background: Climates are changing rapidly, producing warm climate conditions globally not previously observed in modern history. Malaria is of great concern as a cause of human mortality and morbidity, particularly across Africa, thanks in large part to the presence there of a particularly competent suite of mosquito vector species. Methods: I derive spatially explicit estimates of human populations living in regions newly suitable climatically for populations of two key Anopheles gambiae vector complex species in Africa over the coming 50 years, based on ecological niche model projections over two global climate models, two scenarios of climate change, and detailed spatial summaries of human population distributions. Results: For both species, under all scenarios, given the changing spatial distribution of appropriate conditions and the current population distribution, the models predict a reduction of 11.3-30.2% in the percentage of the overall population living in areas climatically suitable for these vector species in coming decades, but reductions and increases are focused in different regions: malaria vector suitability is likely to decrease in West Africa, but increase in eastern and southern Africa. Conclusion: Climate change effects on African malaria vectors shift their distributional potential from west to east and south, which has implications for overall numbers of people exposed to these vector species. Although the total is reduced, malaria is likely to pose novel public health problems in areas where it has not previously been common.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES), Other Climate Scenario

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2, SRES B2

Other Climate Scenario: HadCM3; CGCM1

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Precipitation, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Africa

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Malaria

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Computing System, Exposure Change Prediction, Methodology

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Medium-Term (10-50 years)

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content